THE WELLNESS CENTER

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Consumer Products Group

Vitamins - Water Soluble and Fat Soluble and Psuedovitamins

Vitamins are a group of substances essential to normal metabolism, growth and development, and regulation of cell function; vitamins work together with enzymes, co-factors, and other substances.

Vitamins are usually defined as: A component of a natural food but distinct from carbohydrates, fats, protein, minerals and water. They are present in most foods, and required by the body, in very small amounts. They are essential for fundamental body functions. Their absence will cause a specific deficiency disease or syndrome. They are not synthesized in sufficient amounts to meet physiological demands.

Vitamins are generally classified into two groups, fat soluble and water soluble.

The fat soluble vitamins are Vitamin A, Vitamin D, Vitamin E and Vitamin K.

The water soluble vitamins are Thiamin (B1), Riboflavin (B2), Niacin (B3), Pantothenic Acid, Biotin, Folic Acid, Cobalamin (B12), pyridoxine (B6) and Vitamin C (ascorbic acid).

Care should be taken if one relies on diet to supply all of ones vitamin requirements. With current food processing, cooking, harvesting, weather and genetics there is wide variability of vitamins in foodstuffs. Each vitamin has specific functions. If a certain vitamin is deficient, a deficiency disease results.

Vitamin A: this fat-soluble vitamin helps in the formation and maintenance of healthy teeth, skeletal and soft tissue, mucous membranes, and skin. It is also known as retinol, as it generates the pigments that are necessary for the working of the retina. It promotes good vision, especially in dim light. It may also be required for reproduction and lactation. Beta carotene is a precursor to vitamin A; it has antioxidant properties. Vitamin A is necessary for the synthesis of rhodopsin and other pigments that are used for vision. Vitamin A is also involved in epithelial tissue, bone growth, reproduction and immune functions. Deficiency: A vitamin A deficiency can result in night blindness, poor growth and xerosis. Sources: Beef liver, milk, egg yolks and supplements are good sources of vitamin A. Vitamin A: Retinol, retinal and retinoic acid are names that have been used to describe vitamin A. Body Uses: Provitamin A (carotene) is found in green leafy vegetables, carrots and spinach.

Thiamine(B1): helps the body cells convert carbohydrates into energy. It is also essential for the functioning of the heart and for healthy nerve cells and the brain. Thiamin (B1): Thiamin was one of the first vitamins discovered. As with many of the B vitamins, thiamin is involved in energy metabolism. Body Uses: Hydrochloric acid (stomach acid) is necessary for thiamin absorption. Thiamin's primary function is as a coenzyme for oxidative decarboxylation of keto acids and sugars. Thiamin is involved in the Krebs (TCA cycle) for energy metabolism in the mitochondria and to a limited extent in the cytoplasm. Deficiency: The classic deficiency syndrome for thiamin is Beriberi. Beriberi's symptoms include weakness, loss of appetite and nervous disorders. Additional thiamin deficiency symptoms include edema, an enlarged heart and tachycardia. Sources: Good sources of thiamin include, yeast, whole grains and pork.

Riboflavin(B2): works with the other B vitamins and is important for body growth and red cell production. Similar to thiamine, it helps in releasing energy from carbohydrates. Riboflavin (B2): Riboflavin is a key component of several enzymes necessary for carbohydrate, fat and protein metabolism. Body Uses: Riboflavin is important for flavin adenine dinucleotide (FAD) and flavin mononucleotide (FMN). These compounds help regulate cellular metabolism through oxidation-reduction reactions. Deficiency: A deficiency of riboflavin can result in decreased growth, nervous disorders, degeneration of myelin sheaths, edema and photophobia. Sources: Good sources of riboflavin are meats, nonfat milk and oysters.

Niacin (B3): Forms of niacin include nicotinic acid and nicotinamide. Niacin is involved in over 40 biochemical reactions. Body Uses: Niacin is important for normal tissue integrity, especially the skin, gastrointestinal tract and the nervous system. Niacin is also involved in carbohydrate, fat and protein metabolism. Deficiency: A deficiency of niacin can result in diarrhea, dermatitis, loss of appetite, weakness, decreased growth and mental confusion. Sources: Niacin is widely distributed and good sources are meats, seafood, mushrooms and greens. Niacin may also be added to enriched breads and cereals to help replace niacin loss during processing.

Vitamin (B6): is also known as pyridoxine. The more protein a person eats the more B6 is required to use the protein. It helps in the formation of red blood cells and in the maintenance of normal brain function. It also assists in the synthesizing of antibodies in the immune system. Pyridoxine (B6): Vitamin B6 consists of several compounds including, pyridoxal, pyridoxamine and pyridoxine. Body Uses: Over 50 enzymes depend on B6 coenzymes. B6 is especially involved in amino acid metabolism. Deficiency: A B6 deficiency can result in dermatitis, convulsions, anemia and excitability. Sources: Good sources of B6

are meats, cereals and bananas.

Pantothenic Acid: Pantothenic acid is found in two enzymes - coenzyme A and acyl-carrier-protein (ACP). Pantothenic acid is important for normal tissue metabolism. Body Uses: Pantothenic acid is involved with the synthesis of fatty acids, cholesterol and sterols. Deficiency: While deficiencies are rare, they can include, nervous disorders, edema, subcutaneous hemorrhage, vomiting and fatigue. Sources: Pantothenic acid is widely distributed in plant and animal foods, especially in egg yolks, liver and yeast.

Biotin: Biotin is essential for carbohydrate, fat and protein metabolism. Body Uses: Biotin is involved in the conversion of protein and carbohydrate into fat. Biotin also helps to maintain normal blood glucose levels from fat and protein when carbohydrate is low. Deficiency: Biotin deficiencies are rare but can result in anorexia, nausea and depression. Large intakes of raw egg whites (containing avidin) may induce a deficiency. Sources: Good sources of biotin include, yeast, liver, milk and egg yolks.

Folic acid (Folacin): Folic acid is important as a component of **tetrahydrofolic** acid, which is involved in the transfer of one carbon groups. Body Uses: Folic acid is important for the transfer of methyl groups to help resynthesize methionine from homocysteine and to make choline. Folic acid is also important in the synthesis of purines and pyrimidines. Deficiency: A folic acid deficiency can cause megaloblastic anemia (defective DNA synthesis resulting in abnormal red blood cells especially, in bone marrow), diarrhea, fatigue and depression. A deficiency may also cause neural-tube birth defects. Sources: Yeast, spinach and beef liver are good sources of folic acid.

Great Supplements and More

Vitamin B12, like the other B vitamins, is important for metabolism. It helps in the formation of red blood cells and in the maintenance of the central nervous system. Cobalamin (Vitamin B12): Vitamin B12 is the generic name for a group of compounds with B12 activity. B12 is essential for several enzyme systems. Body Uses: Most reactions using B12 involve the transfer of one carbon units for the methylation of homocysteine. B12 is also important in the metabolism of nucleic acids and proteins. Deficiency: A B12 deficiency can result in anemia, fatty liver, and peripheral nerve degeneration. Sources: Beef liver, meats, fish, poultry and milk are good sources of B12.

Pantothenic acid and biotin: pantothenic acid is essential for the metabolism of food. It is also essential in the synthesis of hormones and cholesterol. Biotin is essential for the metabolism of proteins and carbohydrates like the other B vitamins, and in the synthesis of hormones and cholesterol.

Folacin works with vitamin B12 in the production of red blood cells. It is necessary for the synthesis of DNA, which controls heredity as well as tissue growth and cell function.

Vitamin C is also known as ascorbic acid. It promotes healthy teeth and gums, helps in the absorption of iron, and in the maintenance of normal connective tissue. It also promotes wound healing. Vitamin C (ascorbic acid): Vitamin C is involved in several biochemical reactions. Body Uses: Vitamin C is an antioxidant and is involved in the synthesis of collagen, carnitine and norepinephrine (for arteriole contraction and lipid release). Deficiency: A deficiency of vitamin C can result in fatigue, anorexia, loss of appetite, retarded wound healing and rupture of the capillaries. All of these symptoms are characteristic of the classic vitamin C deficiency - scurvy. Sources: Good sources of vitamin C are papaya, oranges, broccoli and grapefruit juice.

Choline: While choline is not classified as a vitamin, using the classical definition, it is considered as essential, mainly for infants. It is believed that adults can synthesize sufficient amounts of choline. Body Uses: Choline is necessary for cell membrane synthesis, lipid transport, a source of labile methyl groups and acetylcholine (nerve transmission). Choline has been used to treat fatty livers and Alzheimer's disease. Deficiency: Choline is essential for some animals but a classic deficiency has not been demonstrated in humans. Infants, however, may need choline and supplementation is recommended. Sources: Good sources of choline are lecithin, seed oils, liver and egg yolks.

Vitamin D is also known as the "sunshine vitamin" since it is manufactured by the body after being exposed to sunshine. Ten to fifteen minutes of sunshine three times weekly is adequate to produce the body's requirement of vitamin D. It promotes the body's absorption of calcium, which is essential for the normal development of healthy teeth and bones. It also helps maintain the adequate blood levels of calcium and phosphorus, which are minerals. Vitamin D: There are two primary forms of vitamin D, ergocalciferol (D2) and cholecalciferol (D3). Cholecalciferol is found only in animals. The active hormonal form of vitamin D is 1,25 dihydroxycholecalciferol. Body Uses: The primary purpose of vitamin D is to regulate plasma levels of Ca and P to support bone mineralization. Deficiency: A vitamin D deficiency primarily results in rickets in children and osteomalacia in adults. Natural exposure to sunlight will normally provide adequate levels of vitamin D. Sources: Vitamin D can be produced in the skin during exposure to sunlight. Fortified milk and supplements are good sources of vitamin D.

Vitamin E is also known as tocopherol; it is an antioxidant. It is also important in the formation of red blood cells and the use of vitamin K.Vitamin E: Vitamin E activity in food is from a series of compounds called the tocopherols and tocotrienols (trienols). Eight forms are found in nature. Body Uses: Vitamin E is a natural antioxidant that helps prevent cellular damage. The primary function of vitamin E is to maintain cell membrane integrity from oxidative damage. Polyunsaturated fatty acids may increase the need for vitamin E. Deficiency: A deficiency of vitamin E can result in decreased birth weights and anemia in children and neuropathy in adults. Sources: Good sources of vitamin E are vegetable oils, cereal products, liver and vitamin supplements.

Vitamin K is known as the clotting vitamin, because without it blood would not coagulate. Some studies indicate that it helps in maintaining strong bones in the elderly. Vitamin K is used to describe several quinone compounds that helps the blood clotting process. Body Uses: The primary purpose of vitamin K is to activate several blood clotting factors to help blood clot and stop the bleeding process. Deficiency: A deficiency of vitamin K can result in defective blood clotting in children and adults. Sources: Green leafy vegetables, liver, soybeans and supplements are good sources of vitamin K.

Vitamin-like Compounds

Inositol: Inositol's function is not completely understood but inositol is believed to help metabolize fats and may help restore nerve function after nerve damage from diabetes.

Bioflavionoids: Bioflavionoids are a group of compounds found in citrus fruits. There is no evidence that these compounds are essential but additional research may help clarify if they are important for certain disease situations.

Lipoic Acid: Lipoic acid functions, along with thiamin, in certain coenzymes. Lipoic acid can be made in the body.

Carnitine (vitamin B-T): As with choline, carnitine plays a role in fat metabolism. Carnitine helps

transfer fats across the cell membrane for utilization. Usually the body can make carnitine and supplements are not necessary. Some people may require carnitine if sufficient amounts are not made. Possible deficiency signs are, muscle weakness, low blood sugar and high ammonia levels in the blood.

Coenzyme Q: Coenzyme Q is also referred to as ubiquinone. Coenzyme Q is involved in energy metabolism. Research is being conducted to determine if coenzyme Q has a role in treating heart disease.

Para-aminobenzoic acid (PABA): PABA is a part of the folic acid molecule. PABA is used mainly in sunscreens to help prevent sunburn. There is no evidence of a positive effect of PABA when taken orally. Also, ingestion in large amounts can cause vomiting and nausea.

Betaine (trimethylglycine): Betaine is similar to choline in structure. **Betaine**'s primary role appears to be as a methyl donor (supplies one carbon groups). Although not considered to be essential, **betaine** may help reduce the level of homocysteine in the body. While choline and **betaine** are methyl donors, **betaine** appears to be more efficient as a methyl donor in humans.

Pseudovitamins:

Vitamin B17 (Laetrile): Another name used for this compound is amygdalin. At one time this compound was used to treat cancer. There was the thought that the cyanide in laetrile destroyed cancer cells. Research does not support this use.

Vitamin B15 (Pangamic Acid): This compound has not been chemically identified. Products on the market have been shown to contain, calcium gluconate, glycine and dichloroacetate. Dichloroacetae is the only component shown to have pharmacological activity. There is no evidence that pangamate has any therapeutic benefit.

Vitamin B13 (Orotic Acid): Orotic acid is an intermediate in pyrimidine metabolism. Orotic acid is not recognized as a vitamin and may even increase hepatic lipids.

Vitamin H3 (Gerovital or GH3): Vitamin H3 is a buffered solution of procaine hydrochloride (also know as Novocain®), which is a painkiller. Vitamin H3 has been promoted as a nutritional substance that decreases the symptoms of diseases related to aging. There is no sound research to support this claim. This compound is not recognized as a vitamin.

Vitamin U: Vitamin U is the methylsulfonium salt of methionine. Vitamin U is found in cabbage and other green vegetables. Claims have been made that vitamin U is an antipeptic ulcer factor. These claims have not been supported by research. This compound is not recognized as a vitamin.

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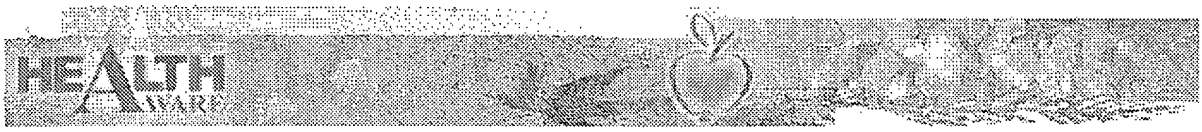

VITAMIN A:

Vitamin A was the first recognized fat - soluble vitamin. Although identified as a necessary growth factor in 1913, it was not chemically characterized until 1930. Two groups of researchers, McCollum and Davis at the University of Wisconsin, and Osborne and Mendel at Yale University, made the initial discovery of vitamin A almost simultaneously. They found that young animals fed a diet deficient in natural fats became very unhealthy, as evidenced by their inability to grow and their poor immune function. These researchers also noted that the animals eyes became severely inflamed and infected on the restricted diet - conditions quickly relieved by the addition of butter fat or cod liver oil to their diet. Once known as the "anti-infective" vitamin, vitamin A recently regained recognition has a major determinant of immune status.

Carotenes, some of which can be converted into vitamin A, are also gaining a great deal of attention as immune system enhancers. Because of the vitamin A activity of some carotenes, I will talk about both vitamin A and carotenes in the same context.

We use a natural "micellized" form of vitamin A, vitamin A palmitate. Micellization is the process of making the fat-soluble vitamin A into very small droplets (micelles) so that the material is easily dispersed in water, thus readily usable by your body.

Vitamin A supports the health of epithelial tissue (skin), mucous membranes (lungs, GI system, organs), retina development of the eyes, cell growth and reproduction, night vision, and normal immunity. Vitamin A works in lipid complexes in our cells. It makes the visual pigment in our eyes, essential for night vision. Since it is fat soluble - we store this vitamin in our tissue. Vitamin A can build up in the body and can cause toxicity -so watch your intake.

The current DV is 5,000IU. We have added 3,000IU of Vitamin A Palmitate to give you 60% DV. This was to ensure that you do not get too much vitamin A. If your body needs more vitamin A than what we supplied, it will convert the mixed carotenes in the formula to vitamin A.

Some Carotenes only have antioxidant properties, while others are precursors of vitamin A. Beta-Carotene, for example, can actually be converted to Vitamin A

by the body as needed.

C (Ca/Mg Ascorbate):

The primary function of vitamin C is the manufacture of collagen, the main protein substance of the human body. Specifically, vitamin C aids the joining of a portion of a molecule of the amino acid proline to form hydroxyproline. The result is a very stable collagen structure. Since collagen is such an important protein for the structures that hold our bodies together (connective tissue, cartilage, tendons, etc.), vitamin C is vital for wound repair, healthy gums, and the prevention of easy bruising.

In addition to its role in collagen metabolism, vitamin C is also critical to immune function, the manufacture of certain nerve transmitting substances and hormones, carnitine synthesis, and the absorption and utilization of other nutritional factors. Vitamin C is also a very important nutritional antioxidant.

The DV is 60 mg/day - it takes 30 mg to prevent scurvy! Linus Pauling recommended 1000 mg/day or more as an antioxidant. The GI tract cannot absorb more than 300-400 mg/dose as the intestinal uptake mechanism is saturated! BioActiv provides 300 mg of ca-ascorbate/mg-ascorbate (both better than ascorbic acid) for 500% DV. Because we supply the 300mg at 3 separate intervals during the day, your tissue saturation levels of vitamin C will always be optimal.

Copper is the catalyst that activates Vitamin C! Bioflavonoids, rutin and HER are synergists of Vitamin C in vascular health. For maximum benefit, don't just take vitamin C alone!

D (cholecalciferol):

Since our bodies can produce vitamin D by the action of sunlight on the skin, many experts consider it more of a hormone than a vitamin. Nonetheless, by current definitions, vitamin D is both a vitamin and a hormone.

There are two major food forms of vitamin D - vitamin D2 (ergocalciferol) and vitamin D3 (cholecalciferol). Vitamin D2, the form most often added to milk and other foods is also the form most often used in nutritional supplements. Vitamin D3 (cholecalciferol), the form we use is more readily usable than vitamin D2. Good natural sources of vitamin D are cod liver oil, cold-water fish (mackerel, salmon, herring, etc.), butter, and egg yolks. Vegetables are low in vitamin D; the best sources are dark green leafy vegetables.

Vitamin D deficiency results in rickets in children and osteomalacia in adults. Rickets, characterized by an inability to calcify the bone matrix, results in softening of the skull bones, bowing of legs, spinal curvature, and increased joint

size. Once common, these diseases are now extremely rare.

Vitamin D deficiency is now most often seen in elderly people who do not get any sunlight, particularly those in nursing homes. The consequences are lack of bone strength and density, and joint pain.

Vitamin D is a fat-soluble: essential for growth and mineralization of bone, and adsorption of calcium from the GI tract.

The DV is 400IU. As a fat soluble, vitamin D can be toxic at 5 times DV. This vitamin has the highest potential of toxicity than any of the others. BioActiv supplies cholecalciferol at 400IU/day for 100% DV. Keep in mind you get Vitamin D from your diet along with sun induced synthesis in your skin, so be leery of supplements that supply very high doses of this nutrient.

E (d-Alpha-tocopherol):

Most animal species, including humans, require vitamin E. In 1922 researchers discovered that when rats ate a purified diet without vitamin E, they became unable to reproduce. When wheat germ oil was added to their diet, fertility returned. Later, scientists isolated vitamin E and called it the "antisterility" vitamin. Alpha-tocopherol is the chemical name for the most active form of vitamin E. The term *tocopherol* comes from the Greek words *tokos,* which means "offspring," and *phero,* which means "to bear." Hence, *tocopherol* literally means "to bear children."

Although the DV for vitamin E (alpha-tocopherol) is set at 20 milligrams (roughly 30 I.U. of vitamin E activity), the amount of vitamin E required is largely dependent upon the amount of polyunsaturated fats in the diet. The more polyunsaturated fats consumed, the greater the risk that they will be damaged. Since vitamin E prevents this damage, as the intake of polyunsaturated fatty acids increases, so does the need for vitamin E.

Fortunately, in nature, where there are high levels of polyunsaturated fatty acids, there are also higher levels of vitamin E. The best sources of vitamin E are polyunsaturated vegetable oils, seeds, nuts, and whole grains. Cooking and processing of foods, especially flour, reduce their vitamin E content. Good sources are asparagus, avocados, berries, green leafy vegetables, and tomatoes.

Vitamin E functions primarily as an antioxidant in protecting against damage to the cell membranes. Without vitamin E, the cells of the body would be quite susceptible to damage, nerve cells in particular. Severe vitamin E deficiency is quite rare, but there are four major conditions where low levels of vitamin E are common:

- Fat malabsorption syndromes, such as celiac disease, cystic fibrosis, and postgastrectomy syndrome
- Premature infants
- Hereditary disorders of red blood cells, such as sickle cell disease and thalassemia
- Hemodialysis patients

Symptoms of vitamin E deficiency in adults include nerve damage, muscle weakness, poor coordination, involuntary movement of the eyes, and breaking of red blood cells, leading to anemia (hemolytic anemia). In premature infants, vitamin E deficiency is characterized by hemolytic anemia and a severe eye disorder known as retrolental fibroplasia.

The DV is 30IU. BioActiv supplies 60IU of d-alpha- tocopherol, the natural form of vitamin E, for 200% DV. Vitamin E is available in many forms, either natural or synthetic. Natural forms of vitamin E are designated *d-*, as in d-alpha-tocopherol, while synthetic forms are *dl-* as in dl-alpha-tocopherol. In the human body, only the *d-* form is recognized. Although the *l-* form has antioxidant activity, it may actually inhibit the *d-* form from entering the cell membranes. Therefore, natural vitamin E has greater benefits than the synthetic form.

The vitamin E in the BioActiv Nutrition Multinutrient is so much more effective than other brands for two reasons. One, because it is the natural form of Vitamin E, and two, because we include the entire complex of naturally occurring unesterified mixed tocopherols. In otherwords, we have not separated d-alpha tocopherol from all the other tocopherols. The most active tocopherol is d-alpha-tocopherol in terms of antioxidant activity, however, d-beta-, d-gamma-, d-delta-, tocopherols, and a group of related compounds known as tocotrienols also exert antioxidant activity. The benefits of these other tocopherols is just now being discovered. Natural vitamin E containing mixed tocopherols offers the greatest benefit. Since this is as nature intended it to be, this boosts it's effectiveness dramatically.

VITAMIN K:

Vitamin K is an often-neglected vitamin because deficiency is quite rare. Vitamin K's most famous role is in the manufacture of clotting factors. However, recent studies show that vitamin K is also necessary for building healthy bones and may play a role in treating and preventing osteoporosis.

There are three major forms of vitamin K - vitamin K, (phylloquinone), the natural vitamin K from plants; vitamin K2 (menaquinone), derived from bacteria in the gut; and vitamin K3 (menadione), a synthetic derivative.

Dark green leafy vegetables, broccoli, lettuce, cabbage, spinach, and green tea